United States Department of Agriculture

Human Nutrition Information Service

Provisional Table on Percent Retention of Nutrients in Food Preparation

EXPLANATION OF TABLE

This provisional table of nutrient retention values was prepared to update and expand the values in ARS 62-13, "Factors Used to Estimate the Retention of Vitamins in Cooked Foods," which aids in the use of the Nutrient Data Bank.

The retention values are based on results from research funded by USDA contracts, recent research reported in the literature, and data from USDA publications. Only those values calculated by the True Retention Method [Murphy et al., Jour. Agr. and Food Chem., 23:16, 1153-57 (1975)] were used since this method, as shown below, accounts for the loss of solids from food that occurs during preparation and cooking.

$$\% \text{ True Retention (TR)} = \frac{\text{Nutrient content per g of cooked food} \times \text{g of food after cooking}}{\text{Nutrient content per g of raw food} \times \text{g of food before cooking}} \times 100$$

Vegetables and legumes were cooked under optimum conditions--shortest possible cooking time to attain doneness and in a minimum amount of water with little or no residual water remaining.

The data presented in these tables are provisional. Additional data will be forthcoming from ongoing research contracts and grants. The table will be updated as more data become available.

2

Provisional Table on Percent Retention of Nutrients in Food Preparation

Food and method of preparation	Ascorbic acid	Thia-min	Ribo-flavin	Nia-cin	Panto-thenic acid	Vita-min B$_6$	Fola-cin	Vita-min A	Vita-min B$_{12}$	Cal-cium	Iron	Magne-sium	Phos-phorus	Potas-sium	Sodium	Zinc	Copper	Manga-nese
MEAT, POULTRY, FISH								Percent										
Beef:[1]																		
Braised	--[2]	45	85	55	--	35	65	--	60	80	100	65	65	55	55	100	95	--
Broiled	--	70	90	80	--	60	85	--	80	100	95	85	90	85	85	100	100	--
Roasted	--	55	95	75	--	50	95	--	70	90	100	85	85	80	85	100	100	--
Pork:																		
Braised	--	40	75	80	55[3]	70	--	--	60	--	100	--	--	75	70	100	100	--
Broiled	--	70	100	80	80	80	--	--	90	75	80	95	--	85	90	100	95	55
Roasted	--	60	95	85	60	85	--	--	80	95	100	75	--	80	80	100	100	85
Poultry:[4]																		
Roasted:																		
Meat	--	70	85	85	75	75	60	75[5]	65	115[6]	95	80	80	80	80	100	80	80
Meat plus skin	--	70	85	85	--	--	--	75[5]	--	110[6]	90	80	80	75	75	100	80	75
Stewed:																		
Meat	--	55	95	60	--	--	--	75[5]	50	85	95	65	70	55	70	100	95	80
Meat plus skin	--	55	95	60	--	--	--	75[5]	--	80	90	65	70	60	70	100	90	75
Fish:																		
Fat, <5% (i.e. carp, cod, croaker, flounder, haddock, halibut, mullet, perch, pollock, rockfish, striped bass, speckled trout, snapper, squid, tuna, whiting):																		
Baked or broiled	--	90	95	95	--	--	--	--	90	--	100	--	--	100	100	100	--	--
Deep fat fried, breaded	--	85	95	100	--	--	--	--	90	--	100	--	--	100	100	100	--	--
Fat, 5-15% (i.e. catfish, sablefish, salmon, rainbow trout):																		
Baked or broiled	--	95	100	100	--	--	--	--	75	--	100	--	--	100	100	100	--	--
Fat, >15% (i.e. eel, herring, lake trout, mackerel, spot):																		
Baked or broiled	--	90	100	95	--	--	--	--	95	--	100	--	--	100	100	100	--	--
Shellfish:																		
Shrimp:																		
Baked	--	95	100	95	--	--	--	--	100	--	100	--	--	100	100	100	--	--
Boiled	--	90	75	75	--	--	--	--	60	--	100	--	--	65	65	100	--	--
Deep fat fried, breaded	--	85	95	95	--	--	--	--	85	--	100	--	--	100	100	100	--	--
Crab:																		
Boiled	--	--	--	--	--	--	--	--	--	100	80	85	70	75	100	100	90	--
Steamed	--	--	--	--	--	--	--	--	--	100	80	100	75	90	100	100	85	--
GRAIN PRODUCTS[7][8]																		
Flours and meals in baked products	--	80	90	90	65	90	70	90	--	100	100	100	100	100	100	100	100	100
Cereals, cooked:																		
Regular and quick cooking	--	80	80	90	85	90	70	90		100	95	100	95	95	100	100	95	95
Instant (precooked)	--	90	95	95	85	100	100	--		100	100	100	100	100	100	100	100	100
Pasta, cooked:																		
Macaroni, noodles, spaghetti	--	65	75	65	--	80	70	95	--	95	75	85	85	30	50[9]	100	90	90
Rice, cooked:																		
Regular	--	80	90	100	--	95	70	95		100	95	100	95	95	100	100	95	95
Precooked	--	85	95	100	--	95	70	--		100	100	100	100	100	100	100	100	100
LEGUMES[8]																		
Cooking time, 15-20 min (i.e. cowpeas, lentils, split peas):																		
Undrained	--	70	80	75	75	75	65	--		90	90	85	95	80	--	90	75	90
Cooking time, 45-75 min (i.e. baby limas, black beans, cranberry beans, great northern beans, kidney beans, large limas, mung beans, navy beans, pink beans, pinto beans, small red beans, small white beans):																		
Undrained	--	65	75	70	75	70	50	--		90	85	80	90	75	--	90	70	85
Cooking time, 2 to 2-1/2 hrs (i.e. broadbeans, chickpeas, pigeon peas):																		
Undrained	--	45	80	60	55	55	35	--		90	80	75	85	70	--	90	60	80

Footnotes at end of table.

Provisional Table on Percent Retention of Nutrients in Food Preparation--Continued

Food and method of preparation	Ascorbic acid	Thiamin	Riboflavin	Niacin	Pantothenic acid	Vitamin B6	Folacin	Vitamin A	Vitamin B12	Calcium	Iron	Magnesium	Phosphorus	Potassium	Sodium	Zinc	Copper	Manganese
								Percent										
VEGETABLES[8]																		
Potatoes:																		
Prepared from raw:																		
Baked in skin	80	85	95	95	90	95	90	--[2]	--	100	100	100	100	100	100	100	100	100
Boiled in skin	75	80	95	95	90	95	90	--	--	95	95	95	95	90	95	95	95	95
Boiled w/o skin	75	80	95	95	90	95	75	--	--	95	95	95	95	90	95	95	95	95
Fried	80	80	95	95	90	95	75	--	--	100	100	100	100	100	100	100	100	100
Hashed-brown[10]	25	40	85	80	--	--	65	--	--	95	95	95	95	90	95	95	95	95
Mashed	75	80	95	95	90	95	75	--	--	95	95	95	95	90	95	95	95	95
Scalloped and au gratin	80	80	95	95	90	95	75	--	--	100	100	100	100	100	100	100	100	100
Prepared from frozen:																		
Baked, stuffed, heated	80	80	95	95	90	95	80	--	--	100	100	100	100	100	100	100	100	100
Fried, heated	80	85	95	95	90	95	80	--	--	100	100	100	100	100	100	100	100	100
Hashed-brown, diced, raw	50	75	95	95	90	95	75	--	--	100	100	100	100	100	100	100	100	100
Sweetpotatoes:																		
Prepared from raw:																		
Baked in skin	80	85	95	95	90	95	90	90		100	100	100	100	100	100	100	100	100
Boiled in skin	75	80	95	95	90	95	90	85		95	95	95	95	90	95	95	95	95
Prepared from frozen:																		
Baked	80	80	95	95	90	95	80	90		100	100	100	100	100	100	100	100	100
Boiled	75	80	95	95	90	95	80	85		95	95	95	95	90	95	95	95	95
Tomatoes, prepared from raw:																		
Baked, boiled, or stewed	95	95	95	95	95	95	70	95		100	100	100	100	100	100	100	100	100
Greens, dark and leafy (i.e. beet greens, Chinese cabbage, collards, kale, mustard greens, spinach, swiss chard, turnip greens):																		
Prepared from raw, drained	60	85	95	90	95	90	65	95		95	95	95	90	90	95	95	95	95
Prepared from frozen, drained	60	90	95	90	95	90	55	95		95	95	95	90	90	95	95	95	95
Roots, bulbs and vegetables of high starch and/or sugar content (i.e. carrots, beets, green peas, onions, parsnips, rutabaga, squash, sweet corn, turnips, immature legume seeds):																		
Prepared from raw, drained	70	85	95	95	90	95	70	90		95	95	95	90	90	95	95	95	95
Prepared from frozen, drained	70	90	95	95	90	95	70	90		95	95	95	90	90	95	95	95	95
Others: (i.e. asparagus, bean sprouts, broccoli, brussels sprout, cabbage, cauliflower, eggplant, okra, snap beans, sweet peppers):																		
Prepared from raw, drained	80	85	95	90	90	90	70	90		95	95	95	90	90	95	95	95	95
Prepared from frozen, drained	80	90	95	90	90	90	70	90		95	95	95	90	90	95	95	95	95
FRUITS[8] [11]																		
Prepared from dried, frozen, or raw:																		
Boiled or stewed	70	80	90	90	95	90	50	75		95	100	100	100	90	100	100	90	100

[1] Separable lean was used to calculate nutrient retentions for beef.
[2] Dashes denote lack of reliable data.
[3] Pantothenic acid values for braised pork are from total edible portion (lean and fat).
[4] Poultry was cooked without removal of skin.
[5] Vitamin A values are from ARS 62-13; based on data from cooked chicken.
[6] Calcium values greater than 100% retention could be caused by migration of calcium from the bone into the meat.
[7] Values are based on limited data.
[8] Pantothenic acid values are based on data from other cooked plant products.
[9] Pastas were cooked without added salt.
[10] Potatoes were pared, boiled, and held overnight before hashed-browning.
[11] Values for ascorbic acid, thiamin, riboflavin, niacin, and vitamin A are from ARS 62-13; all other values are based on pared, sliced, fresh, and frozen boiled apples.

p. 4